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<b>Notice of Allowability</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/508,971	YOSHIDA ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Ben Lewis	1745	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**  
 All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 9/07/06.
2. ☒ The allowed claim(s) is/are 1 and 3-7.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☒ All    b) ☐ Some\*    c) ☐ None    of the:
    1. ☒ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  5. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

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|---|--|
| <ol style="list-style-type: none"> <li>1. <input type="checkbox"/> Notice of References Cited (PTO-892)</li> <li>2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)</li> <li>3. <input checked="" type="checkbox"/> Information Disclosure Statements (PTO/SB/08),<br/>Paper No./Mail Date <u>9/11/06</u></li> <li>4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit of Biological Material</li> </ol> | <ol style="list-style-type: none"> <li>5. <input type="checkbox"/> Notice of Informal Patent Application</li> <li>6. <input type="checkbox"/> Interview Summary (PTO-413),<br/>Paper No./Mail Date _____</li> <li>7. <input type="checkbox"/> Examiner's Amendment/Comment</li> <li>8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance</li> <li>9. <input type="checkbox"/> Other _____</li> </ol> |
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## DETAILED ACTION

### REASONS FOR ALLOWANCE

Claims 1 and 3-7 are allowed. The invention of independent claim 1 recites:

An electrolyte membrane-electrode assembly comprising a hydrogen ion conductive polymer electrolyte membrane and a pair of electrodes sandwiching the polymer electrolyte membrane therebetween, each said electrode comprising a catalyst layer and a gas diffusion layer attached to said polymer electrolyte membrane, wherein:

said gas diffusion layer comprises a fabric having a warp thread and a weft thread which are made of carbon fiber, and the distance X between adjacent intersections where said warp and weft threads cross each other and the thickness Y of said fabric satisfy the equation:  $1.4 \leq X/Y \leq 3.5$ ,

wherein the height A and the width B of said warp thread, and the height C and the width D of said weft thread respectively satisfy  $0.2 \leq A/B \leq 0.4$  and  $0.1 \leq C/D \leq 0.4$ .

The invention of independent claim 7 recites:

A polymer electrolyte fuel cell characterized in that said fuel cell comprising:

(a) an electrolyte membrane-electrode assembly comprising a hydrogen ion conductive polymer electrolyte membrane and a pair of electrodes sandwiching said polymer electrolyte membrane therebetween, said electrode comprising a catalyst layer attached to the polymer electrolyte membrane and a gas diffusion layer, said gas diffusion layer comprising a fabric comprising a warp thread and a weft thread which are made of carbon fiber, the distance  $X$  between adjacent intersections where said warp and weft threads cross each other and the thickness  $Y$  of said fabric satisfying the equation:  $1.4 \leq X/Y \leq 3.5$ ; and

(b) a pair of conductive separator plates having a gas channel on the face in contact with said gas diffusion layer of said electrolyte membrane-electrode assembly and sandwiching said electrolyte membrane-electrode assembly such that said separator plate is attached to said gas diffusion layer of the electrolyte membrane-electrode assembly, a clamping pressure of 1 to 20 kgf/cm<sup>2</sup> being applied per the area where each of said electrodes and each of said conductive separator plates are in contact with each other,

wherein the height  $A$  and the width  $B$  of said warp thread, and the height  $C$  and the width  $D$  of said weft thread respectively satisfy  $0.2 \leq A/B \leq 0.4$  and  $0.1 \leq C/D \leq 0.4$ .

The prior art does not teach or suggest a cell including all of the claimed features. The most pertinent art includes over Hirahara et al (U.S. Pub. No. 2002/0160252 A1), which teaches a conductive carbonaceous fiber sheet for solid polymer electrolyte fuel cell wherein two-folded yarns composed of single yarns each obtained by collecting from 45 to 50 polyacrylonitrile-based long oxidized fibers having a monofilament diameter of 8  $\mu\text{m}$  with twisting were woven at a warp density and a weft density of 50 yarns and 46 yarns, respectively, per inch to obtain an oxidized plain weave fabric. This woven fabric was heated to 900  $^{\circ}\text{C}$  in a nitrogen stream to carbonize it and then heated to 2,000  $^{\circ}\text{C}$  in an argon atmosphere to conduct graphitization. The graphitized carbonaceous-fiber woven fabric obtained had a warp density of 70 yarns per inch (corresponding to 276 yarns per 10 cm) and a weft density of 54 yarns per inch (corresponding to 213 yarns per 10 cm) (Paragraph 0072).

The Hirahara et al reference does not teach or suggest a fabric having a warp thread and a weft thread which are made of carbon fiber, and the distance X between adjacent intersections where said warp and weft threads cross each other and the thickness Y of said fabric satisfy the equation: 1.4 less than or equal to  $X/Y$  less than or equal to 3.5,

wherein the height A and the width B of said warp thread, and the height C and the width D of said weft thread respectively satisfy 0.2 less than or equal to  $A/B$  less than or equal to 0.4 and 0.1 less than or equal to  $C/D$  less than or equal to 0.4. Since the fibers of Hirahara et al have a monofilament diameter of 8  $\mu\text{m}$  they do not have the

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rectangular geometry which satisfy the ratio limitations of claims 1 and 7 of the threads of the instant invention.

For these reasons, the claims are allowed over the prior art. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ben Lewis whose telephone number is 571-272-6481. The examiner can normally be reached on 8:30am - 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Ben Lewis



PATRICK JOSEPH RYAN  
SUPERVISORY PATENT EXAMINER

Patent Examiner  
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